

CLAIMS

[1] A solid state image pickup device for obtaining a two-dimensional image, comprising:

5 a plurality of pixel units that are arranged two-dimensionally and each include a photoelectric conversion unit operable to convert incident light into a charge and an amplification unit operable to convert the charge into a voltage and output the voltage;

10 a plurality of noise signal removal units that are provided one for each column and operable to remove a noise contained in the voltage outputted from said amplification unit of said pixel unit belonging to the column; and

15 a plurality of column amplification units operable to amplify the voltage outputted from said amplification unit of said pixel unit belonging to the column and output the amplified voltage to said noise signal removal unit corresponding to the column.

[2] The solid state image pickup device according to claim 1, further comprising:

20 an impedance conversion unit operable to convert an impedance for the voltage outputted from said noise signal removal units; and

 an output signal amplification unit operable to amplify the voltage outputted from said impedance conversion unit.

25 [3] The solid state image pickup device according to claim 2,
 wherein said impedance conversion unit is a source follower circuit.

30 [4] The solid state image pickup device according to claim 1,
 wherein each of said column amplification units includes:
 an inverting amplifier; and
 a switching unit provided between an input terminal and an

output terminal of said inverting amplifier.

- [5] The solid state image pickup device according to claim 1,
wherein each of said column amplification units includes:
5 a plurality of column amplification circuits having different
amplification degrees; and
 a selection circuit that selects one of said column
amplification circuits according to a level of the input voltage.
- 10 [6] The solid state image pickup device according to claim 1,
wherein said noise signal removal units use a capacitance
distribution method.
- [7] The solid state image pickup device according to claim 1,
15 wherein each of said noise signal removal units has a
capacitor, and
 said capacitor is an N-type MOS capacitor.
- [8] The solid state image pickup device according to claim 1,
20 wherein transistors that said solid state image pickup device
has are all N-type MOS transistors.
- [9] The solid state image pickup device according to claim 1, further
comprising
25 a boosting voltage application unit operable to apply, to a load
circuit that each of said column amplification units has, a power
supply voltage and a boosting voltage higher than the power supply
voltage.
- 30 [10] The solid state image pickup device according to claim 9,
wherein said boosting voltage application unit is a charge
pump circuit that boosts the power supply voltage by a charge pump

method.

[11] The solid state image pickup device according to claim 10,
wherein said charge pump circuit boosts the power supply
5 voltage by using a driving pulse which selects a column.

[12] The solid state image pickup device according to claim 9,
wherein said boosting voltage application unit is a bootstrap
circuit that is provided within each of said column amplification units
10 and applies, to said load circuit, the power supply voltage and the
boosting voltage higher than the power supply voltage.

[13] The solid state image pickup device according to claim 9,
wherein said load circuit is a first MOS transistor for load, and
15 the power supply voltage is applied to a drain of said first MOS
transistor and the boosting voltage is applied to a gate of said first
MOS transistor.

[14] The solid state image pickup device according to claim 13,
20 wherein each of said column amplification units includes a
second MOS transistor for driving,
a source of said first MOS transistor is connected to a drain of
said second MOS transistor and the voltage outputted from said
amplification unit of said pixel unit belonging to the column is
25 applied to a gate of said second MOS transistor through a clamp
capacitance, and

the voltage outputted from said amplification unit of said
pixel unit belonging to the column is amplified by an amplification
degree determined by a ratio between resistance values of said first
30 and second MOS transistors.

[15] The solid state image pickup device according to claim 14,

wherein each of said column amplification units changes the amplification degree according to an input level of the voltage outputted from said amplification unit of said pixel unit belonging to the column.

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[16] The solid state image pickup device according to claim 14, wherein each of said column amplification units includes: a plurality of column amplification units having different amplification degrees; and

10 a selection unit operable to select one of said column amplification units according to an input level of the voltage outputted from said amplification unit of said pixel unit belonging to the column.

15 [17] The solid state image pickup device according to claim 14, wherein said column amplification units increase the amplification degree as an input level of the voltage outputted from said amplification unit of said pixel unit belonging to the column decreases.

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[18] The solid state image pickup device according to claim 14, wherein each of said column amplification units further includes a third MOS transistor for making voltages at the drain and gate of said second MOS transistor the same, and

25 initial state is set by a threshold voltage of said second MOS transistor and a black level signal inputted to said column amplification units through the clamp capacitance from said amplification unit of said pixel unit.

30 [19] The solid state image pickup device according to claim 14, wherein each of said column amplification units includes an interruption unit operable to interrupt a drive

current of said second MOS transistor except during a necessary operation period.

[20] The solid state image pickup device according to claim 9,
5 further comprising an impedance conversion unit operable to convert an impedance for the voltage outputted from said noise signal removal units.

[21] The solid state image pickup device according to claim 20,
10 wherein said impedance conversion unit is a source follower circuit structured by using an NMOS transistor.

[22] The solid state image pickup device according to claim 9,
15 wherein said noise signal removal unit has a capacitor, and said capacitor is an N-type MOS capacitor.

[23] The solid state image pickup device according to claim 9,
20 wherein said transistors that said solid state image pickup device has are all NMOS transistors.

[24] The solid state image pickup device according to claim 9,
25 wherein said column amplification units are structured so as to be on a lower frequency side than a frequency band of said amplification units of said pixel units, and bandwidth-shape a noise frequency.

[25] The solid state image pickup device according to claim 9,
30 wherein said noise removal units are structured so as to be on a lower frequency side than a frequency band of said amplification units of said pixel units, and bandwidth-shape a noise frequency.

[26] A camera having said solid state image pickup device according

to claim 1.